

04/26/00

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UTILITY PATENT APPLICATION TRANSMITTAL (Only for new nonprovisional applications under 37 CFR 1.53(b))	Attorney Docket No.	P00,0558
	First Named Inventor or Application Identifier	
	Wolfgang Huber et al,	
	Express Mail Label No: # EL482398021US	

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ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

APPLICATION ELEMENTS		ACCOMPANYING APPLICATION PARTS	
See MPEP chapter 600 concerning utility patent application contents.			
1. <input checked="" type="checkbox"/> Specification	[Total Pages <u>15</u>]	5. <input type="checkbox"/> Assignment Papers (cover sheet & documentation)	
2. <input checked="" type="checkbox"/> Drawing(s) (35USC 113)	[Total Pages <u>3</u>]	6. <input checked="" type="checkbox"/> Letter under 37 CFR 1.41(c).	
3. <input checked="" type="checkbox"/> Declaration and Power of Attorney	[Total Pages <u>2</u>]	7. <input type="checkbox"/> English Translation Document (<i>if applicable</i>)	
a. <input type="checkbox"/> Newly executed declaration (Original copy)		8. <input type="checkbox"/> Information Disclosure Statement (IDS)/PTO-1449	Copies of IDS Citations
b. <input type="checkbox"/> Copy from prior application (37CFR 1.63(d)) <i>(for continuation/divisional with Box 14 completed)</i>		9. <input type="checkbox"/> Preliminary Amendment	
i. <input type="checkbox"/> <i>[Note Box 4 Below]</i> DELETION OF INVENTOR(S) Signed statement attached deleting Inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).		10. <input checked="" type="checkbox"/> Return Receipt Postcard (MPEP 503) <i>(Should be specifically itemized)</i>	
Incorporation By Reference (usable if Box 3b is checked) The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 3b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.		11. <input type="checkbox"/> Small Entity Statement(s) <input type="checkbox"/> Statement filed in prior application, Status still proper and desired	
		12. <input type="checkbox"/> Certified Copy of Priority Document(s) German Application No. 199 19 924.8 filed April 30, 1999	
		13. <input type="checkbox"/> Other:	

14. If a CONTINUING APPLICATION, check appropriate box and supply the requisite information:

Continuation Divisional Continuation-in-part (CIP) of prior application No: /

CLAIMS AS FILED					
	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) BASIC FEE \$690.00
	TOTAL CLAIMS	20	15		
	INDEPENDENT CLAIMS	3	3		
		ANY MULTIPLE DEPENDENT CLAIMS? (YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>			
		TOTAL FILING FEE ->			\$690.00

The Commissioner is hereby authorized to charge any additional fees which may be required in connection with this application, or credit any overpayment to ACCOUNT NO. 08-2290. A duplicate copy of this sheet is enclosed.

A check in the amount of \$ 690.00 to cover the filing fee is enclosed.

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April 26, 2000

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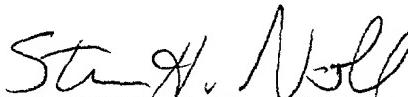
Re: Proposed Patent Application for WOLFGANG HUBER and MOHAMMAD MEHDIANPOUR entitled "A METHOD, APPARATUS AND SYSTEM FOR OPERATING AN AUTOMATIC COMPONENT MOUNTING UNIT FOR MOUNTING COMPONENTS ONTO A SUBSTRATE OF AN ELECTRICAL ASSEMBLY", Attorney Docket No. P00,0558

SIR:

Under the provisions of 37 CFR § 1.41 (c), I am filing the attached application with 15 claims, 3 sheets of informal drawings and filing fee on behalf of WOLFGANG HUBER and MOHAMMAD MEHDIANPOUR and request that the application papers be assigned a serial number and filing date.

I request that the application be assigned a Serial No. and Filing Date pursuant to the provisions of 37 C.F.R. § 1.53(b) and 37 C.F.R. § 1.53(f).

Respectfully submitted,



Steven H. Noll (Reg. No. 28,982)
Attorney for Applicant

CERTIFICATE OF MAILING BY "EXPRESS MAIL"

"Express Mail" Mailing Label Number **EL 482398021US**

Date of Deposit: April 26, 2000

I hereby certify that the following is being deposited with the United States Postal "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to The Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Proposed Patent Application for WOLFGANG HUBER, MOHAMMAD MEDHIANPOUR entitled "A METHOD, APPARATUS AND SYSTEM FOR OPERATING AN AUTOMATIC COMPONENT MOUNTING UNIT FOR MOUNTING COMPONENTS ONTO A SUBSTRATE OF AN ELECTRICAL ASSEMBLY", consisting of specification, claims, 3 sheets of informal drawings, and Government Filing Fee, Attorney Docket No. P00,0558

I Pradiw

Signature of person
mailing application

Name of person mailing
application

COPY

S P E C I F I C A T I O N

T I T L E

**"A METHOD, APPARATUS AND SYSTEM FOR OPERATING
AN AUTOMATIC COMPONENT MOUNTING UNIT FOR MOUNTING
COMPONENTS ONTO A SUBSTRATE OF AN ELECTRICAL ASSEMBLY"**

BACKGROUND OF THE INVENTION

Field of the Invention

The invention relates to a method, apparatus and system for operating an automatic electrical component mounting unit that can be readily adapted to mount a variety of different electrical components by utilizing a number of different mounting unit members, such as a mounting head, feeding and sensor member.

Description of the Prior Art

It is generally known that automatic component mounting units are utilized to place or mount an electrical component onto a substrate of an electrical assembly. The component mounting unit utilizes a number of sensors to precisely and correctly determine where the components need to be positioned or placed onto the substrate. In this way, a control device of the automatic mounting unit can then communicate with the sensors in order to precisely control the movement of the mounting head member for mounting the component onto the substrate.

However, there exists a need in the art for an automatic mounting unit to be readily adaptable for mounting a variety of different components onto a variety of different substrates, thus, allowing for optimal flexibility within the component mounting operation. In order to meet

this need, it is generally known that an automatic mounting unit is readily adapted by utilizing a variety of different mounting members, such as, the mounting head, feeding and sensor members. Each of the automatic mounting unit members are known to exist in a variety of different constructions that can be adapted for use in the mounting a number of different components and substrates that vary with respect to shape, size, or other like property.

For example, a mounting head member is constructed for accepting a number of components at the same time. In this way, a number of components can be mounted before the mounting head member is supplied with other components for mounting. As a result, the component mounting rate is effectively increased due to the optimal utilization of the mounting head member. In addition, a mounting head can also be constructed for accepting only one component at a time where the mounting rate is compromised for precision and control.

However, a problem in the art still exists in the downtime that is required to calibrate the automatic mounting unit after every adjustment or replacement of one or more of its member that is necessary to meet the varying component mounting process demands. With an increased downtime, the process automation is compromised.

United States Patent No. 5,537,204 ("the '204 patent") attempts to address the component mounting unit calibration problem that was previously discussed. The '204 patent discloses a calibration method and apparatus that utilizes a glass plate or substrate. The glass plate is placed on a working station of a "pick-and-place" machine wherein the machine acts to place a glass slide onto the glass plate. The alignment or positioning of the glass slide relative to a reference marker on the glass substrate is then optically examined. The calibration measurements are then inputted into a control device for utilization during a subsequent mounting process. However,

the calibration method of the '204 patent is substantially time intensive, that is, it takes approximately one to two hours.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a method, apparatus and system for operating an automatic component mounting unit that has a number of different mounting members and that is readily calibrated for optimally mounting a variety of different components onto a variety of different substrates. The automatic mounting unit of the present invention utilizes a number of members, such as, the component mounting head, feeding and sensor members, that can be readily adapted to a variety of different components and substrates.

In an embodiment, each of the members of the component mounting unit includes a respective data storage device. The data storage device stores and processes data that relates to each of the respective mounting members. In this way, the data can be processed by a control device of the component mounting unit for utilization during every stage of the component mounting operation.

In an embodiment, the data storage device stores a variety of different process or characteristic data, such as, the geometrical or positioning data that has been measured relative to a fixed reference. This data can then be utilized for readily calibrating one or more of the automatic component mounting members virtually upon immediate installation. To accomplish this virtual real-time calibration, the control device communicates with the data storage device in order to configure the movement and positioning of the mounting member so that the mounting member is essentially ready for operation once it has been installed. In this way, the time-consuming calibration step subsequent to installation is effectively eliminated.

In an embodiment, the manufacturer identification codes of the different mounting members can be stored in the data storage device. This type of data is then processed by the control device for recognizing or identifying defective mounting members.

In a preferred embodiment, the functional or operational data of the mounting members is stored and processed by the control device via the data storage device for utilization during the component mounting operations. In this way, the control device can optimally control the operation of the component mounting members.

In an embodiment, the data exchange between the respective storage devices of each of the members and the control device occurs via electrical lines.

In an embodiment, a wireless data exchange occurs between the storage device and the control device. In this way, the process control equipment that is necessary for the operation of the automatic component mounting unit is minimized because additional electrical plug-connections are not required when a wireless data communication is utilized.

In a preferred embodiment, the mounting head member includes a number of holding elements, such as, suction pipettes or other like holding elements, in order to securely hold the component. Each of the suction pipettes includes a retracted and an extended position wherein the difference of the retracted and extended positions of each of the suction pipettes on the component mounting head can be calculated for purposes of calibrating the component mounting head for precise and controlled mounting of the component on the substrate.

In a preferred embodiment, the data storage devices include a transponder device, that is, a device that can process characteristic data, i.e. read and write data, in a contactless manner and that does not require its own energy supply. In addition, the transponder devices can be readily integrated within each of the mounting members.

In an embodiment, the component mounting member includes a component mounting head member, a component feeding member, a component sensor member or other like member. Each of the mounting members has a respective data storage device that stores process data which is specific to its respective mounting member. The process data varies with respect to the type of component that is to be mounted.

DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic side view of an automatic component mounting unit.

Figure 2 is a schematic plan view of an automatic component mounting unit.

Figure 3 is a schematic side view of a component mounting head member wherein process data that is specific to the component mounting head is measured prior to installation.

Figure 4 is a flow chart of the method for operating the automatic component mounting unit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In Figures 1 and 2, an automatic component mounting unit 7 is illustrated that operates to mount a number of components 2 onto a respective substrate 1 as the substrate 1 moves along the conveying or transport mechanism 10. The automatic component mounting unit 7 includes a component mounting feeding member 3 that supplies the component mounting unit 7 with a number of components 2 for mounting. In addition, the component mounting unit 7 includes a component mounting head member 5 that has a number of holding elements, such as, suction pipettes 4, for accepting and securely holding the components 2 which are supplied from the feeding unit 3. Once the component mounting head member 5 receives the components 2, the

components can then be transported to and placed onto a predetermined position of the substrate

1.

In order for the component mounting head member 5 to receive a component 2 from the feeding unit 3 and then to subsequently mount the component 2 onto the substrate 1, the component mounting head member 5 moves along a first bar 11 via a first carriage 12. The component mounting head member 5 then moves along a second bar 13 via a second carriage 14 in order for the component mounting head member 5 to mount the component 2 onto the substrate 1. The first 11 and second 13 bars are positioned perpendicular to one another.

Further, the automatic component mounting unit 7 includes a control device 6 for controlling the operation of the automatic component mounting unit 7. For example, the control device 6 controls the movement of the second carriage 14 towards the first carriage 12 for the precise and controlled delivery, transport and placing of the component 2 onto the substrate 1.

Prior to mounting the component 2 onto the substrate 1, a component camera 21 receives an image of the component 2 that is securely held by one of the suction pipettes 4 of the component mounting head member 5. The component camera 21 then transmits the image to the control device 6 which in turn processes the image and operates to control the motion of the component mounting head member 5 in order for the component 2 to be precisely placed or mounted on the substrate 1 in the predetermined or predescribed position.

The automatic component mounting unit 7 also includes a conveying or transport mechanism 10 which operates to transport or move the substrates 1 into a conveying position or path for the component mounting operation. A substrate camera 17 is positioned above the conveying mechanism 10 for determining the position of the substrate 1 relative to the

component mounting head member 5. In this way, the position of the substrate 1 is also utilized to determine the correct positioning of the components 2 on the substrate 1.

The component mounting head member 5 includes a respective head data storage device 15 that stores process data regarding the component mounting head member 5. This data is then transmitted to and processed by the control device 6 via a wireless or hard wire communication. The head data storage device 15 can be integrated within the component mounting head member 5. In this way, the storage and processing of the component mounting head member process data can be transmitted in a contactless manner by a data processing unit, such as, a transponder device. Alternatively, the mounting head process data can be stored and processed on a data storage medium, such as a floppy disk or other like storage medium. The stored data can then be inputted and processed by a floppy disk drive of the control device 6 via the floppy disk.

The component feeding member 3 of the automatic component mounting unit 7 also includes a respective feeding storage device 16. In addition, the substrate camera 17 includes its own substrate camera storage device 18. The head, feeding, and substrate camera storage devices contain characteristic data that relates to the component mounting head member, the component mounting feeding member 3 and the substrate camera 17, respectively. In this way, the data of each of these members of the automatic component mounting unit can be readily transmitted to the control device 6 during the component mounting operation. The control device 6 utilizes this data for controlling the precise and controlled mounting of the components 2 onto the substrate 1.

In Figure 3, the characteristic data of the component mounting head member 5 is stored on the respective head data storage device 15 prior to the installation of the component mounting head member 5 onto the automatic component mounting unit 7. The component mounting head

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member 5 preferably includes a turret head 5a that has a total of eight suction pipettes 4. Each of the suction pipettes 4 are attached along the circumference of the of the turret head 5a of the component mounting head member 5. In order to store the characteristic or process data of the component mounting head member 5, the component mounting head member 5 is moved into a testing stand prior to the final installation. In the testing stand, the extended position of the first suction pipette 4 is subsequently optically measured by a stationary camera 22. The extended position essentially corresponds to the position of the suction pipette 4 when the component 2 is mounted onto the substrate 1. Next, the retracted position of the first suction pipette 4 is measured by the component camera 21. The retracted position essentially corresponds to the position of the suction pipette during the transport or movement of the component 2 from the feeding unit 3 to the substrate 1 via the component mounting head member 5. The difference between the measurements of the retracted and extended position of the first suction pipette 4 is then evaluated by a testing control device 20. This process is repeated for all of the 7 other suction pipettes 4 wherein any deviation of the measurements of any of the other 7 suction pipettes relative to the measurements of the first suction pipette is recorded by the testing control device 20 and is then subsequently stored in the head data storage device 15. After installation of the component mounting head member 5 onto the automatic component mounting unit 7, it is therefore only necessary to determine the positioning of the first suction pipette 4 at the retraction and extension positions in a known way. As a result, the positioning parameters, i.e., the retraction position, the extension position and differences thereof, are known if the component mounting head member 5 is connected to the automatic mounting unit 7 via a highly-precise mechanical interface whose reference mark with respect to the automatic mounting unit

is known or are optically measured by utilizing stationary sensors and a reference material, such as a glass substrate with a glass component.

Once the positioning parameters of the first suction pipette 4 are determined and stored, the head storage device 15 then transmits this positioning data of the first suction pipette 4, along with the data of all the other suction pipettes, to the control device 6 wherein the data can then be processed. The automatic component mounting unit 7 can then calculate the positioning of the seven other suction pipettes relative to the positioning of the first suction pipette 4 based on the positioning parameter data of the first suction pipette 4 that was generated as previously discussed.

However, the present invention is not limited by utilizing the first suction pipette 4 as a reference to determine the positioning of the other suction pipettes. Other fixed reference marks can also be selected whose precise position relative to the automatic component mounting unit 7 is known or can be simply measured. Therefore, the fixed reference mark data of the automatic component mounting unit 7 can be utilized to calibrate the positioning of the suction pipettes 4 of the component head mounting member as well as the positioning of other mounting members. In this way, the positioning data can be stored within the data storage device of each of the respective mounting members wherein this data can be transmitted to the control device 6 for utilization during the mounting operation.

In Figure 4, the operation of the automatic component mounting unit 7 is demonstrated in a flow chart. First, the characteristic or process data of each of the members of the automatic component mounting unit 7, such as, the component mounting head 5, feeding 3, and substrate camera 17 are initially determined. The characteristic data can include geometrical, positioning, manufacturer identification, functional, operational, or other like mounting process data that is

specific to each of the mounting members. The characteristic data of each of the members is then stored in each of the mounting member's respective storage device such as the head 15, feeding 16 and substrate 18 storage devices. The mounting members are then installed wherein the process data is transmitted to the control device 6. The control device 6 then utilizes this data for controlling the mounting operation. As a result, the mounting members can be readily adapted for optimal use essentially upon immediate installation of the mounting members.

Although modifications and changes may be suggested by those skilled in the art, it is the intention of the inventors to embody within the patent warranted hereon all changes and modifications as reasonably and properly come within the scope of their contribution to the art.

WE CLAIM AS OUR INVENTION:

1. A method for operating an automatic component mounting unit comprising the steps of:

providing said automatic component mounting unit for mounting an electrical component onto a substrate of an electrical assembly, said automatic component mounting unit including a plurality of mounting members and a mounting control device for controlling each of said mounting members;

generating an amount of mounting process data for each of said mounting members prior to the installation of each of said mounting members onto said automatic component mounting unit;

storing said process data of each of said mounting unit members within a respective mounting data storage device;

installing each of said component mounting unit members onto said automatic component mounting unit;

transmitting at least a portion of said amount of mounting process data from said respective mounting data storage device of each of said mounting members to said control device upon said installation of each of said mounting members; and processing said amount of process data by said control device for controlling each of said mounting members during said mounting of said electrical components so that each of said mounting members are readily configured for optimal use upon said installation.

2. A method according to claim 1 wherein said process data of each of said mounting members comprises an amount of positioning data.

3. A method according to claim 1 wherein said process data of each of said mounting members comprises an amount of manufacturer identification code data.
4. A method according to claim 1 wherein said process data of each of said mounting members comprises an amount of functional data.
5. A method according to claim 1 wherein said process data transmitting step comprises an electrical hard-wire process data transmission.
6. A method according to claim 1 wherein said process data transmitting step comprises a wireless process data transmission.
7. A method according to claim 1 wherein said mounting members include a mounting head and feeding member.
8. A method according to claim 7 wherein said mounting head member includes a plurality of holding elements for securely holding said component, wherein each of said holding elements includes a respective first and second holding position and wherein said holding elements include a first holding element.
9. A method according to claim 8 further comprising the steps of measuring said first and second holding positions of each of said holding elements by an optical measuring device, storing an amount of said holding position data within said mounting member data storage device wherein said amount of holding position data is generated by calculating a difference between said first and second holding position measurements, calibrating a first holding element relative to said automatic mounting unit, calibrating a remaining number of said holding elements relative to said first holding element calibration by utilizing said amount of holding position data, storing an amount of calibration data that was generated during said calibration of each of said holding elements within said mounting member data storage device,

transmitting said amount of said calibration data to said control device via said mounting member data storage device so as readily configure said holding elements for optimal use during said mounting of said electrical component.

10. An automatic component mounting unit for mounting an electrical component onto a substrate of an electrical assembly, comprising:

a plurality of mounting members disposed for mounting said electrical component, each of said mounting members including a respective data storage device wherein each of said data storage devices stores an amount of mounting process data of each of said respective mounting members; and

a control device disposed for controlling said automatic component mounting unit, each of said data storage devices transmitting said amount of mounting process data to said control device wherein said amount of mounting process data is utilized so as to adapt each of said mounting members for optimal use during said mounting of said electrical component.

11. An automatic component mounting unit according to claim 10 wherein each of said data storage devices includes a transponder unit for communicating with said control device in a contactless manner, and wherein said transponder unit is directly attached to each of said mounting members.

12. An automatic component mounting unit according to claim 10 wherein said mounting members include a mounting head member.

13. An automatic component mounting unit according to claim 10 wherein said mounting members include a mounting feeding member.

14. An automatic component mounting unit according to claim 10 wherein said mounting members include a mounting sensor member.

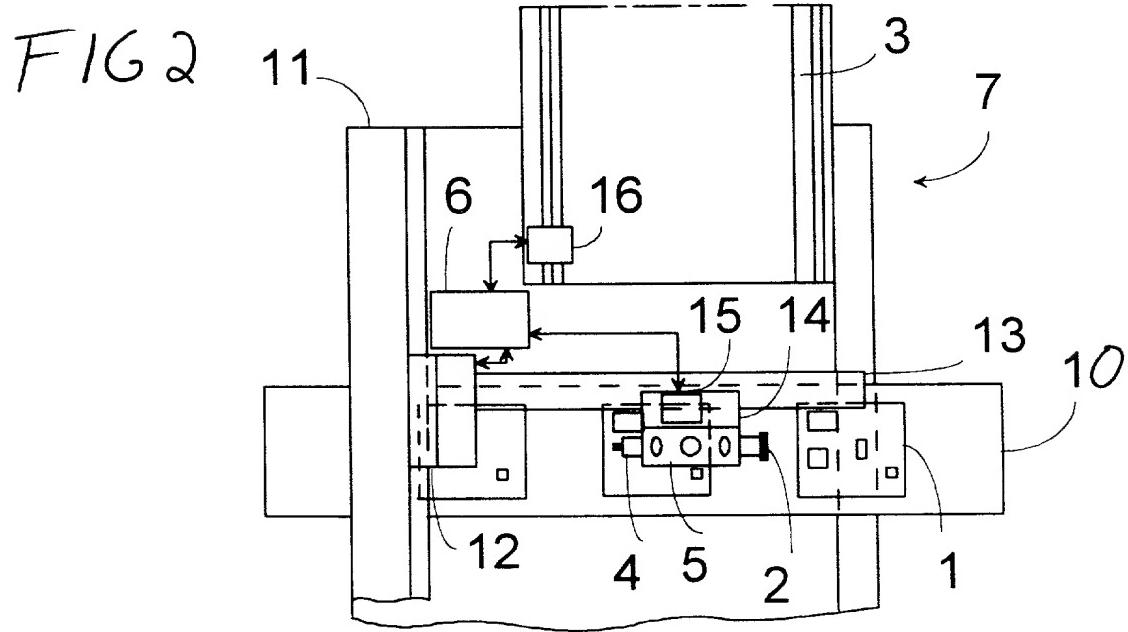
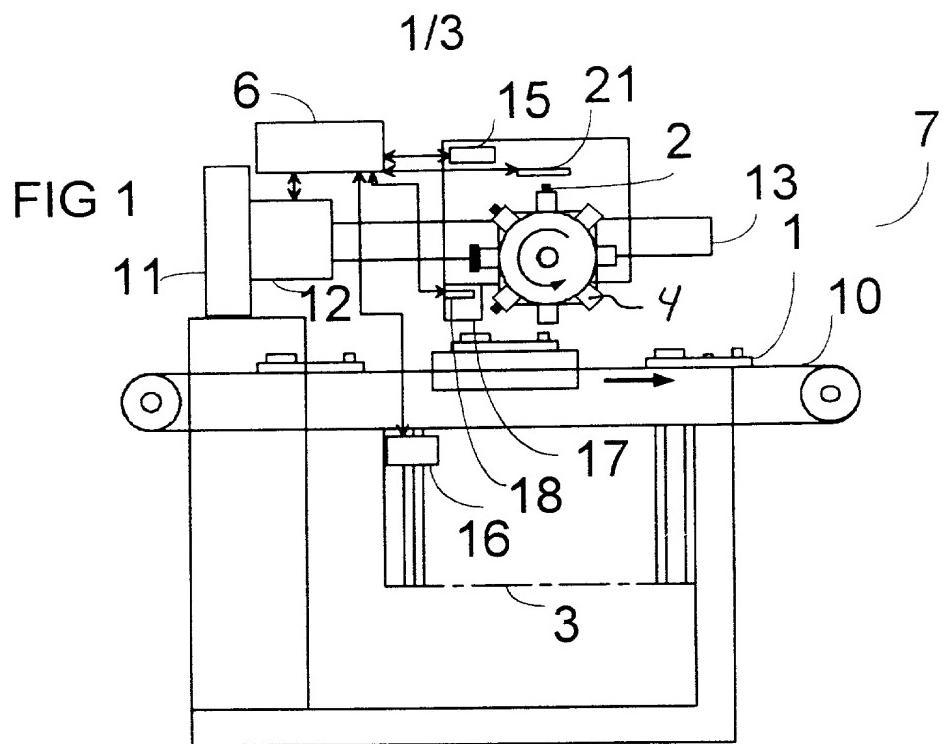
15. A system for operating an automatic component mounting unit for mounting an electrical component onto a substrate of an electrical assembly, comprising a plurality of mounting members installed for mounting said electrical component wherein each of said members includes a respective data storage device for storing an amount of process data, a control device communicating with each of said data storage devices for processing said amount of process data wherein said control device utilizes said amount of process data so as to readily adapt each of said mounting members for optimal use upon installation of each of said mounting members to said automatic component mounting unit.

P R I V A T E P R O P E R T Y

ABSTRACT OF THE DISCLOSURE

A method, apparatus and system for operating an automatic component mounting unit for mounting an electrical component onto a substrate of an electrical assembly. The automatic component mounting unit utilizes a number of different mounting members, such as, a head, feeding and sensor members, for mounting a variety of different components. The automatic component mounting unit also includes a control device for communicating with a data storage device of each of said mounting members for processing an amount of process data that is specific to each of said mounting members and that is generated prior to installation. As a result, the mounting members are readily configured for optimal use upon installation of said mounting members.

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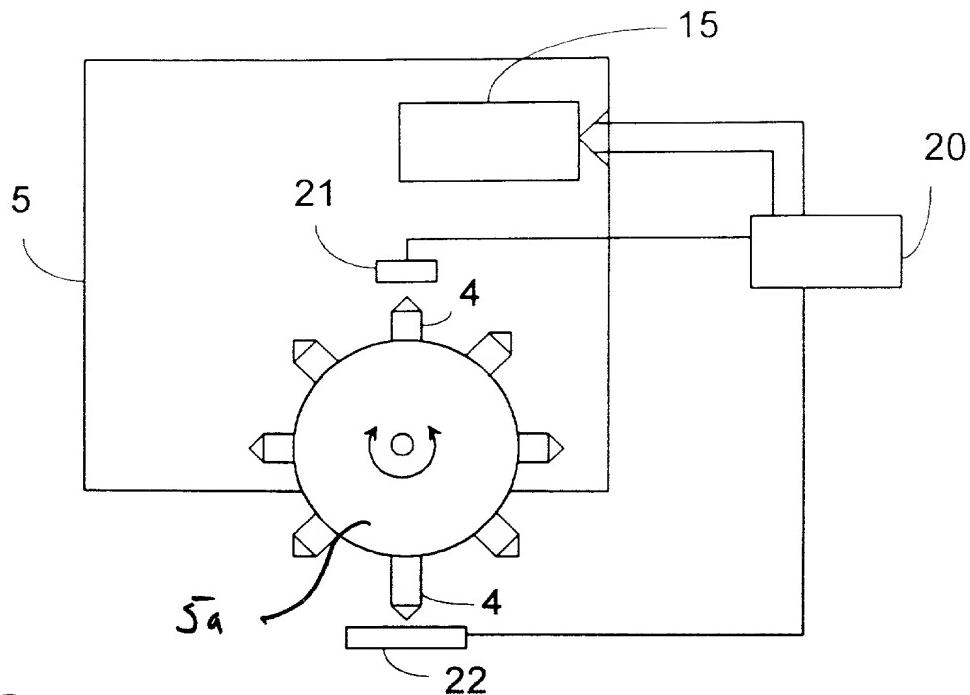


FIG 3

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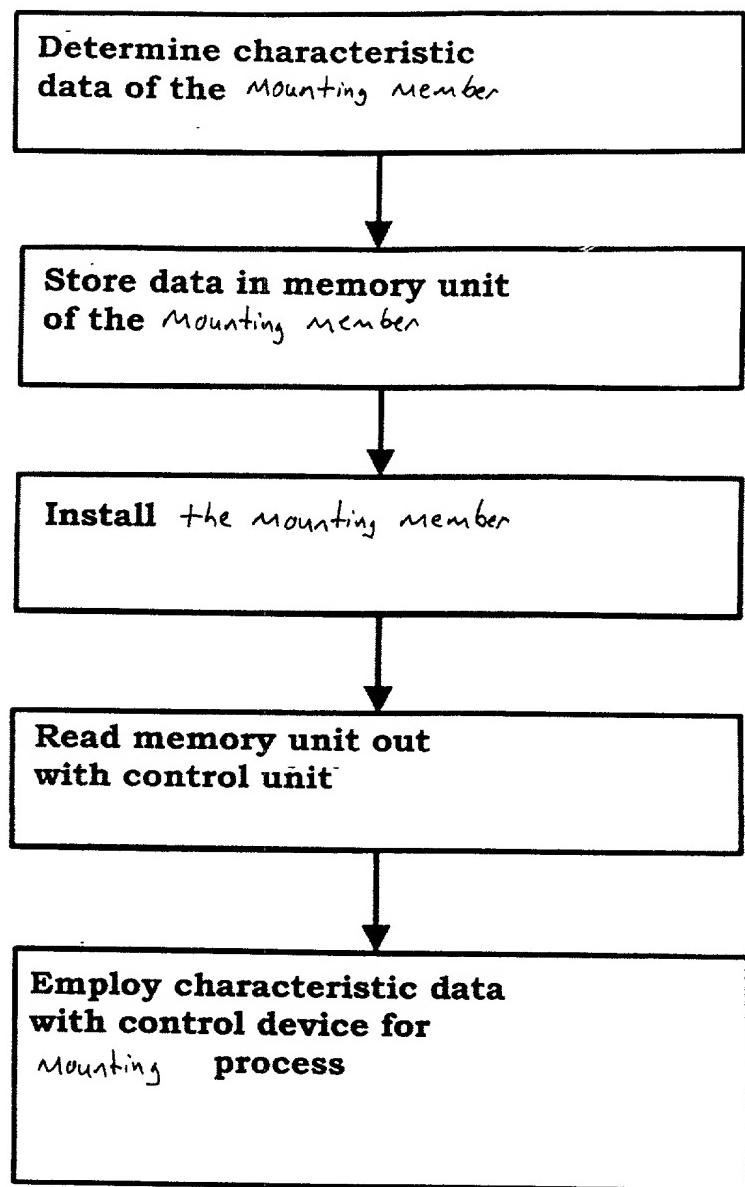


FIG 4

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that.

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

'A METHOD, APPARATUS AND SYSTEM FOR OPERATING AN AUTOMATIC COMPONENT MOUNTING UNIT FOR MOUNTING COMPONENTS ONTO A SUBSTRATE OF AN ELECTRICAL ASSEMBLY'

Case No. P00,0558, the specification of which

(check
one) X is attached hereto.
— was filed on _____, as
Application Serial No. _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent Office all information which is known to me to be material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, 1.56.¹

I do not know and do not believe this invention was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and I believe that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, except as identified below:

I hereby claim foreign priority benefits under Title 35, United States Code, 119 of any foreign application(s) for patent or inventor's certificate listed below

Prior Foreign Application(s) Number	Country	Date
19919924.8	Fed. Rep. Germany	April 30, 1999

and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the above listed application on which priority is claimed:

Prior Foreign Application(s) Number	Country	Date
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¹ (b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

- (1) It establishes, by itself or in combination with other information, a *prima facie* case of unpatentability of a claim, or
- (2) It refutes, or is inconsistent with, position the applicant takes in
 - (i) Opposing an argument of unpatentability relied on by the Office, or
 - (ii) Asserting an argument of patentability

A *prima facie* case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability

If no priority is claimed, I have identified all foreign patent applications filed prior to this application:
Prior Foreign Application(s)
Number Country Date

And I hereby appoint Messrs. John D. Simpson (Registration No 19,842), Dennis A. Gross (24,410), Robert M. Barrett, (30,142), Steven H. Noll (28,982), Kevin W. Guynn (29,927), Robert M. Ward (26,517), Brett A. Valiquet (27,841), Edward A. Lehman (22,312), David R. Metzger (32,919), Todd S. Parkhurst (26,494), James D. Hobart (24,149), Melvin A. Robinson (31,870), Joseph P. Reagan (35,332), Michael R. Hull (35,902), Michael S. Leonard (37,557), William E. Vaughan (39,056), and Lewis T. Steadman (17,074) all members of the firm of Hill & Simpson, A Professional Corporation

Telephone 312/876-0200 Ext. 3491
my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and direct that all correspondence be forwarded to:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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